

**Do Disadvantaged Children from Indonesia Work More When their Parents Are Poorer?
Evidence from a Regression Discontinuity**

Treena Wu[†] and Lex Borghans[‡]
^{†‡}Maastricht University and [‡]IZA

Abstract

Using a fuzzy regression discontinuity design with the 1997/98 Asian Financial Crisis as the cutoff, we study the behavior of Indonesian children aged 6 – 14 who work. We study this using their time use patterns. We find that disadvantaged children work more hours / week when household income falls. This working behavior is more apparent in the modernized and urbanized Java and Bali Islands. However children continue to accumulate human capital from three sources of skill formation i) formal school ii) non-formal school (religious education) iii) informal school (education within the home). Using the Becker view on human capital measured as productive skills, we find that disadvantaged children from Indonesia can simultaneously work and build human capital without too many tradeoffs in time. Their parents demonstrate a preference for education. As such the children's work behavior is not deemed as being harmful for their skills development.

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This is a preliminary draft. For correspondence: [†] treena.wu@maastrichtuniversity.nl and
[‡] lex.borghans@maastrichtuniversity.nl

1. Introduction

In response to increased public interest in child labor in poor countries and the proliferation of empirical work in this area, we consider this phenomenon in terms of the child's human capital accumulation. As defined by Becker (1964), education is considered to be an investment in productive skills that generates future returns. This view is silent on how and where children attain this education that builds productive skills. Arguably the source of skill formation is a pressing issue especially for disadvantaged children who have far fewer quality schooling choices than children from rich families. In the education and economic growth literature as surveyed by Krueger and Lindahl (2001), conventional measures of attendance flows in the formal school system are used to determine human capital. Arguably these flows are a flawed measure. If children are enrolled but do not attend the full schooling hours in a week, are they working? If yes, does this necessarily mean that they have become child laborers? Are these children losing out on the accumulation of human capital when working? These questions similarly relate to the findings by Cameron (2001) where in Indonesia declines in schooling do not appear to be accompanied by a rise in formal employment amongst children. Schooling enrollment is simply not telling us much about child labor.

In this paper we aim to investigate two issues. The first issue concerns rethinking the different sources from which children can develop productive skills which can be both social and economic. This source should not be limited to a formal schooling system that is structured, hierarchical and continuous. As argued by Heckman and Lochner (2001), formal or institutional education is only one aspect of the learning process, and recent research indicates that it is not necessarily the most important one. From the publication of the Coleman Report (1996), we know that families and environments play a crucial role in motivating and producing educational success as measured by test scores. While the Coleman Report applies to children in American society, we see no reason why these findings should not also be associated with children in developing countries.

The United Nations International Labor Organization (ILO) acknowledges that not all work done by children should be classified as child labor that is to be targeted by international organizations and country policymakers for elimination. In its preamble to the definition of the type of work that is not targeted, the ILO writes “Children’s or adolescents’ participation in work that does not affect their health and personal development or interfere with their schooling, is generally regarded as being something positive. This includes activities such as helping their parents around the home, assisting in a family business or earning pocket money outside school hours and during school holidays. These kinds of activities contribute to children’s development and to the welfare of their families; they provide them with skills and experience, and help to prepare them to be productive members of society during their adult life.”

The second issue we would like to investigate is what we can and cannot observe from children reported as being absent from school while being officially enrolled. We attempt to analyze and infer the behavior of children by studying their weekly time use patterns (Edmonds, 2007). We consider time use in a formal curriculum as dictated by education policy and time use for other activities related to skill formation. We will study this in the context of children aged 6 - 14 in Indonesia living in the different main islands where they can spend their time gaining skills from a formal school (primary and secondary), non-formal school (religious education, *madrasah*) or informal school (education within the home). Informal skills training can be viewed as learning-on-the-job but within the home environment, e.g. helping parents by learning how to sew and how to grow vegetables for sale at the market. We focus on this age group because they are in an important child developmental phase which may be compromised if they are subjected to physically and mentally harmful work.

By addressing these two issues, we hope to contribute to a better understanding of what is and isn’t child work targeted for elimination within the context of Indonesia. Labor studies of plantations and industry carried out by the Census Bureau of Statistics (*Badan Pusat Statistik*) have found child workers who can be classified as i) working for their families without pay ii) working and learning simultaneously and iii) working as paid

casual laborers. The question then is how and where the line is drawn on the worst forms of child labor.

To carry out this investigation we start with a simple human capital investment model to formalize our ideas. We assume a unitary household model / common preferences model. In addition the household structure remains unchanged with parents and not more than two biological children. Parents can either choose to invest or not invest in their children's human capital under the conditions of credit constraints in an incomplete credit market. This is dependent on an implicit cost benefit analysis and the outcome is productive skills in broad terms. Such skills can have both social and private returns. Social returns can be thought of in terms of externalities from education. Citing an example from Kreuger and Lindahl (2001), this can be where education produces positive externalities such as a reduction in crime and welfare participation or more informed political decision making. Private returns refer to monetary returns from the labor market albeit formal or informal in a developing country context. If yes there is parental investment, this is observed or inferred from how and where children spend their time. This can be in terms of three sources of skills formation i) formal school ii) non-formal school or iii) informal school. For the last source of skill formation, we consider this in terms of the empirical studies for primitive and developing societies (Mincer, 1962; Becker 1987 and 1989; Locay, 1997) where children may be engaged in learning activity while at home with their mothers. This is arguably because women with children from these types of societies have an incentive to engage in activities that are complementary to child care. From this model, we can shed some light on whether children absent from school based on conventional measures are ending up in shrill populist terms as child laborers in a Nike factory.

We use data from the lower middle income country Indonesia because of its richness of detail and focus on poor disadvantaged children. Also Indonesia is a country that has so much diversity spread across its archipelago of over 17,000 islands. Or put in other terms, its geography contains so much variation that it is akin to studying everything stretched across the geography of Oregon State in the US to Bermuda. Or in Europe this physical

juxtaposition would be from London to Moscow. We are cognizant of the fact that behavior in a lower middle income country may not be entirely the same as in much poorer countries. But our findings as afforded to us by data availability will have applicability for developing countries in general.

The rest of the paper is organized in the following way. Section 2 describes our model of human capital investment where we describe in greater detail our two parameters of interest parents' income and children's human capital. This is followed by Section 3 where we set up a fuzzy regression discontinuity design as our empirical strategy and provide a description of our dataset, the RAND Corporation Indonesia Family Life Surveys (IFLS). The main feature of IFLS is that it has data that highlights formal, non-formal and informal sources of skill formation. Limitations arising from the observed data i.e. child labor as the dependent variable is a censored variable (Basu et al, 2007), underreporting on child labor and missing values are included. Section 4 covers results, findings and limitations. This section also looks at the findings in the context of intra-household allocation behavior. Taken as a whole, the intent of this section is to highlight the caveats in the findings for this complex child labor phenomenon. Conclusions and a discussion on further research are in Section 5.

2. Human Capital Investment Model

This simple model as motivated by Becker (1964) is designed primarily to determine when human capital investment does or does not occur. When there is no investment, the household only makes consumption decisions. In this model there is an economy that lasts two periods. In period 1, parents work in the formal economy, informal economy or engage in household production. They consume c , save s , choose to send their child to school, $e = 0$ or 1 , and then die at the end of the period. Household utility i is represented by the following:

$$\ln c_i + \ln \hat{c}_i \dots(1)$$

where \hat{c}_i is the child's consumption. There is heterogeneity among children in a given household so the cost of education θ_i , be it formal or informal education varies with i . In the second period, the child with an education grows up to become skilled and receives a wage w_s and unskilled worker receives w_u .

Then consider that there are no credit constraints or in other words there are complete credit markets. Parents can borrow to finance their children's education while paying the same interest rate r , as the rate that they would obtain by saving. The decision problem changes to one where the parents with income y_i are to maximize (1) with respect to e_i , c_i and \hat{c}_i subject to the budget constraint:

$$c_i + \frac{\hat{c}_i}{1+r} \leq \frac{w_u}{1+r} + e_i \cdot \frac{w_s - w_u}{1+r} + y_i - e_i \cdot \theta \dots(2)$$

Given (2) which is the underlying premise of the separation theorem, this means that in the presence of perfect credit markets, pure investment decisions will be independent of preferences. Put another way, the education decision will be made to maximize the budget set of the consumer. Specifically, parents will choose to educate their child only if

$$\theta_i \leq \frac{w_s - w_u}{1+r} \dots(3)$$

When r in (3) is higher, the right hand side will become smaller than the left hand side which is the cost of education θ_i . The result is that parents will make decisions about financing education in terms of an investment entailing upfront costs and delayed benefits.

Next the assumption of perfect credit markets is removed from this model and parents are very likely to have zero or negative savings. They will have to borrow to finance their child's education. Given this premise, the utilities from investing (4) and not investing (5) in education are given by:

$$U(e = 1|y_i, \theta_i) = \ln(y_i - \theta_i) + \ln w_s \dots(4)$$

$$U(e = 0|y_i, \theta_i) = \ln(y_i - \theta_i) + \ln w_u \dots (5)$$

By comparing (4) and (5) this implies that only parents with

$$\theta_i \leq y_i \cdot \frac{w_s - w_u}{w_s} \dots (6)$$

will invest in education. An implication of this model is that if credit constrained parents in developing countries were to choose to invest in their children's human capital, this will entail adopting alternative schooling methods to keep the cost of education affordable.

The specification of schooling methods covers a wide scope consisting of i) formal education which has teaching and learning activities that are gradual, hierarchical and continuous; ii) non-formal education which is organized outside the formal education system that may or may not be hierarchical and continuous; iii) informal education is education that comes from within the family which constitutes an important part of the out-of-school education.

The next section details the empirical strategy to better identify our parameters of interest and the IFLS dataset in use with the data limitations we try to work around. In addition we frame this empirical strategy and the data against the backdrop of the Indonesian education system.

3. Empirical Strategy & Data

3.1 Identification Strategy

Following Van Der Klaauw (1997) and Angrist and Krueger (1999), our research design is a fuzzy regression discontinuity design where we exploit the timing of the RAND Corporation Indonesia Family Life Surveys (IFLS) wave 2 (1997) and wave 3 (2000) to identify a threshold or structural break S being the Asian Financial Crisis (AFC). We carry out non-parametric estimation to control for smooth or gradually evolving trends. We infer causality when our variable of interest child labor changes abruptly for non-behavioral reasons because of the AFC. The difference between the fuzzy RD design and

the deterministic RD design is that the probability of receiving the treatment does not change from zero to one at the threshold. (Imbens and Lemieux, 2007)

The AFC occurred at the end of 1997 with effects in the financial markets felt until the beginning of 2000. It had interrupted a thirty year period of rapid growth in East and South East Asia. In Indonesia, real per capita GDP rose four-fold between 1965 and 1995 with an annual growth rate averaging 4.5% until the 1990s when it rose to almost 5.5% (World Bank, 1997). The poverty headcount rate declined from over 40% in 1976 to just under 18% by 1996. Primary school enrollment rates rose from 75% in 1970 to universal enrollment by 1995 and secondary enrollment rates from 13% to 55% over the same period (World Bank, 1997). The total fertility rate fell from 5.6 in 1971 to 2.8 in 1997¹. Total estimated population in 2008 is 227 million². In April 1997, the financial crisis began to be felt in the Southeast Asian region, although the major impact did not hit Indonesia until December 1997 and January 1998. Real GDP declined 13% in 1998, stayed constant in 1999 and finally began growing in 2000 by 4.5%. Macroeconomic data from BPS shows that the decline in GDP in 1998 hit investment levels very hard. Real gross domestic fixed investment fell in 1998 by 35.5%. For the household sector, much of the impact was due to rapid and large swings in prices, which may have resulted from extreme exchange rate volatility. The CPI more or less doubled in this period for food, housing, clothing and health. But the direction of the relationship between prices and currency depreciation is uncertain as it is endogenously determined.

Between 1997 and 1998³, the percentage of 13-19 year olds that were not currently enrolled in school rose. The percentage not enrolled increased more in urban areas — from 33 percent in 1997 to 38 percent in 1998, a change that is statistically significant. Children from poorer households in general were more likely to be out of school than children from better off households — a phenomenon that intensified between 1997 and 1998. The change is also reflected in drop out rates. Younger children were less likely to be in school in 1998 as well. This is especially true for the poorest. The percentage of 7-

¹ Indonesia Central Bureau of Statistics et al. (*Badan Pusat Statistik*, BPS) 1998

² *Proyeksi Penduduk 2000 – 2025*, BPS 2005

³ World Bank Indonesia statistics

12 year olds in the bottom quartile of the distribution of per capita expenditure that were not enrolled implying delayed starting in school doubled, from about 6% in 1997 to about 12% in 1998.

Against this backdrop, we apply what Angrist and Krueger (1999) describe as a hybrid regression control / IV identification strategy. The instrument is the Asian Financial Crisis which is an aggregate shock, S . It is derived explicitly from non-linearities or discontinuities in the relationship between family income and child labor. We then proceed to use a simple matching method to study parents' spending on education and their children's time spent in formal, non-formal and informal sources of learning ex-ante and ex-post. Only biological parent – child relationships are considered. For the fuzzy assignment we specify the selection or assignment equation in terms of a general function of S and $I(S > \bar{S})$ and an error term e_i :

$$T_i = 1 \text{ if } g(S_i, I(S_i > \bar{S})) + e_i > 0$$

$$T_i = 0 \text{ otherwise}$$

where T_i is the treatment ($T_i = 1$), e_i may be correlated with u_i in the outcome equation and where I is the indicator function. By including $I(S > \bar{S})$ we acknowledge the possibility that the assignment function may still contain some discontinuities coming from the structural break of S . The function of g will later be specified in reduced form after non-parametric estimation. An advantage of the fuzzy design is that it is geared towards the subpopulation of families with children who work and given the complexities of this phenomenon, randomization will not work. This fuzzy RD design also enables greater flexibility in the assignment of the treatment. We refer to the parents and children observed before the discontinuity as the comparison group and the parents and children observed after the discontinuity the treatment group. We match the comparison and treatment group on the same demographic characteristics which serve as conditioning variables. However we do not use gender as a conditioning variable. This is because based on anthropological studies as well as empirical studies there is no gender biased preference in Indonesian families (Niehof and Lubis, 2003; Levine and Ames, 2003).

Figure 1 graphically represents the fuzzy RD design where the AFC is measured in terms of the period of extreme currency depreciation of the Indonesian Rupiah (IDR) against the US Dollar (USD). Since we can only observe household and child behavior in 1997 and 2000, we acknowledge that we cannot observe anything at the threshold which is spread across 1998 and 1999; this is where there is severe unpredictability in behavior.

In IFLS there are survey questions concerning i) whether a child works (binary variable) and ii) if yes, the number of hours worked in a week. While the dataset captures hours worked by school and non-school days in the week, we merge the data together. We do not make a distinction between school and non-school days because we do not make an *a priori* assumption that a school day refers to the formal primary and secondary school. The number of responses that have missing values for these two survey questions is substantially high which makes this a censoring problem. But the number of responses that have zero values is low. As such our strategy to address this problem is to first have a restricted sample without missing values. This will help us to better understand the characteristics and behavior of children who do work and whether they work more or less in response to the exogenous shock. We are able to exploit IFLS to study the behavior of children in terms of the following combinations i) attending school using conventional measures and working and ii) attending school in an alternative way that may or may not be called work. It may be about gaining skills with social returns. Or it may be learning on the job. This is because IFLS has unique information on children attending formal, non-formal and informal schools.

There is also a survey question on whether children receive wages for their work. However there is a problem where this question was only asked in 2000 and there are substantially high missing values. As such we are not able to explore further the issue of paid work.

After studying the restricted sample, we go back to the unrestricted sample where we substitute the missing values with zeros. This is a very simple imputed value strategy. But we do this as a first attempt to study the whole distribution of children working. We take

the view that if there are more zeros which mean zero hours worked, ex-ante compared to ex-post then this is consistent with theory; reduced income causes more hours worked, *ceteris paribus*.

3.2 Indonesia Family Life Surveys (IFLS)

The IFLS are household surveys on family income, consumption, expenditures and welfare. The surveys cover different units of analysis at the level of the individual, household and community. At the individual level, there is information based on the different biological and non-biological relationships which enable intra-household allocation analysis. For this paper, we only focus on biological relationships. The RAND Corporation uses the same stratified random sample design as the Indonesia Census Bureau of Statistics (BPS) administered national household surveys known as SUSENAS. As such the findings from IFLS are representative of the Indonesian population. There is a larger sample size in 2000 to account for attrition and in order to maintain panel characteristics in the data. However IFLS covers fewer provinces in the Indonesian archipelago compared to SUSENAS. See Map 1 for this coverage. The Indonesian archipelago consists of 17,000 islands spread across 1.3 million square km with 227 million people speaking over 20 dialects and represented by highly diverse culture. Religions practiced include predominantly Islam and there is also Christianity, Buddhism and Hinduism. By law, Indonesia is a secular state.

Simply put, Indonesia is a polyglot nation.

Using Map 1, there is an urban / rural split and this is defined by BPS and government as a Java-Bali / Outer Islands split. Because of modernization and consequently urbanization, Java and Bali Islands have attracted the majority of the population. Java and Bali based on BPS estimates in 2003 are home to 60% of the total country population but represent only 7% of the total land mass in Indonesia. Labor market estimates for Jakarta alone which is situated in Java Island has an estimated eight million people registered as residing in the capital but has arguably over twelve million people entering the city to work each day. In contrast the Outer Islands are considered to be rural in terms of being

less developed and having a lower population density. Over 70% of the labor market is informal (Arifianto, 2006). In IFLS, there is information that helps us to refine analysis in spatial terms. There are geo-codes for provinces in each island. Map 2 provides more detail concerning provinces across the archipelago.

We use IFLS to study children aged 6 – 14 who are in primary (*Sekolah Dasar or SD*) and junior secondary school (*Sekolah Menengah Pertama or SMP*). In IFLS, primary school consists of six grades and junior secondary school has three grades. In the formal school system, these two levels are administered by the Ministry of National Education (MoNE). Table 2 provides a description of the formal school curriculum structured by academic hours per week which we will use later to analyze time use patterns. At the end of the primary school level there is a national level examination to enable transition to the junior secondary school level. This standardized examination is known as EBTANAS in IFLS. In IFLS there are test scores for the Indonesian language (*Bahasa Indonesia*), Math, Science, Social Studies and Religious Education. The scale is 1 – 10 and the passing mark is 5.5. In the Indonesia national education system, this counts as the Basic Education level (Figure 2) which is a national education priority for the government. This priority is in relation to the achievement of the United Nations Millennium Development Goals. If children do not attend the formal school system, they can attend the non-formal school system administered by the Ministry of Religious Affairs (MoRA) or by private charities. Increasingly over time private charities are introducing a higher proportion of local content into their curriculum which is in keeping with the country's decentralization trend. However schooling quality between public formal schools and non-formal schools differ. Public formal schools have higher quality in terms of schooling inputs such as the availability of textbooks and better teacher qualifications (Newhouse and Beegle, 2005). Another alternative for the children is informal school which is not regulated by MoNE and MoRA). This source of skill formation is derived from education within the home or within the community. Children from informal schools can choose to take EBTANAS the standardized exam.

There are 4,983 observations of children in IFLS2 from 1997 and 9,735 observations in IFLS3 from 2000. Given the problem with missing values, our restricted sample has 92 observations ex-ante and 140 observations ex-post for children who report working (> 0 hours).

A serious limitation of IFLS which is unavoidable and we account for this in our empirical strategy is the possibility of household break-up in longitudinal study designs. This limitation arguably cannot simply be explained away in terms of attrition. As explained by Rosenzweig and Foster (2001) this design problem stems in part from the relative absence of attention in the theoretical and empirical literature to the determination of household structure. We try to address this problem by looking at the data in terms of household splitting for educational reasons i.e. a child may be moved from one of the underdeveloped Outer Islands to get a better education in the modernized Java where there is more school choice. See Table 1 where there is only a small degree of household splitting as children move for schooling reasons. The percentage of households in the sample splitting for education reasons remains steady at 20% ex-ante and ex-post. The degree of household splitting only increases when the child is older than 15 and moves from junior secondary school (SMP) to senior secondary school (*Sekolah Menengah Atas or SMA*).

4 Findings

4.1 Descriptive Statistics and Kernel Densities

When the AFC occurred, we find that on average household income fell due to a substantial increase in the cost of living. From Figure 3 where log of income is reported, we can see that the distribution of household income shifted to the left and there is greater variability. There were severe reductions to the consumption of market valued goods and services and in savings. Strauss et al (2004) report that during this period household coping mechanisms included some parents working extra jobs or specifically mothers entering the labor market for the first time. Given this change in household behavior with more labor supply, we find that children from some households worked as well. However the observed data does not tell us enough whether they worked for wages. This then

suggests that children who are working and possibly without wage may in fact be carrying out activities that the ILO terms as not interfering with schooling. But we are on shaky ground here. Just because we do not have sufficient responses on work for wages, this does not mean that it is not occurring.

Intuitively whether children only started to work in response to a shock turns out to be incorrect. Based on the observed data we find that children in the comparison group worked as well. Table 3 demonstrates that 92 children worked more than zeros hours per week. Their household income falls into the range that is at the 25th percentile of the household income distribution from Figure 1. This means that only poor disadvantaged children worked. In comparison the number of working children observed in the treatment group has increased by 52%.

The mean hours worked for the treatment group versus the comparison group has also increased. The children used to work on average 22.09 hours a week. After the shock, they worked a higher average of 26.79 hours.

In terms of income and education expenditures we can see that from Table 3 the average income level for the treatment group is higher than the comparison group. This is related to extreme outliers in the observed data for both treatment and comparison groups. This increase in average income by 7% may be consistent with household coping strategies in response to the shock. Both parents may be working and their children are taking over certain activities in the home. When helping out at home for a certain time in the week, the children may also be saving on expenses related to being in close proximity to school in order to attend classes, such as school meals and paying for a place to sleep. Based on area specific fieldwork studies in Indonesia (Graeme, 2000; Wu, 2008) on internal population movement, some older children pay a small fee to rent a room (or a bed) to sleep in that is in close walking distance to their school. They rent the room on school days and go home to be with their parents on non-school days. Substantial savings can be made if needed by the household, when foregoing spending on food and boarding. In the

data, we find that for the comparison group this makes up 37.4% of education expenditures. For the treatment group, this increased to 48.5%.

But from Table 3, it can be strongly inferred that children have not dropped out from school completely. Or in other words, children are working and going to school simultaneously each week. This is because households that have children who work continue to spend on education. This spending covers school fees; monthly scheduled fees including parents' contributions to schools run by private charities; exam fees; books, writing supplies, uniforms, sports equipment such as badminton and football; allowances for food and boarding; transportation costs and fees for extra tuition. The average expenditure on education is higher in the treatment group than the comparison group. Based on empirical studies of the AFC, this is explained as being related to extreme inflation levels. To add support to the inference that there is continued spending on education despite the aggregate shock, we refer to the Indonesian SUSENAS Household Surveys. Based on the education module time series⁴, nominal education expenditures have grown almost stepwise since 1993, with spurts in 1995, 1998, 2000 and 2002. This finding then lends support to the human capital investment model.

We proceed to study the behavior of simultaneously working and going to school. First we look at the comparison group that consists of all children from the whole household income distribution and the type of schools they are attending. This is regardless of whether the children work or not. All rich and poor children are attending either formal school, non-formal school or informal school. This can be seen in the descriptive statistics in Table 4. Specifically 87% of the children are in formal school. This then strongly infers that children on average are receiving higher quality education ex-ante. But in the treatment group, we find that 7% of the children are attending informal schooling or education within the home. This did not occur in the comparison group. This appears to lend support to children changing their schooling behavior to help their parents cope with the shock as well as to enable their parents to continue to invest in human

⁴ SUSENAS Benchmarking Health and Education Data, 2003

capital. This is as implied in the human capital investment model for credit constrained parents.

But whether the changes in attendance by different school type results in children working more hours, we have to study this by restricting the sample to those working more than zero hours / week. With reference to Table 5, we find that there are more children working in the treatment versus the comparison group. Also there is a higher number of working children in formal and informal school in the treatment group. But there is barely any change in non-formal school / religious schooling numbers in both the treatment and comparison groups.

From the descriptive statistics in Table 5, it can be inferred that disadvantaged children who work when the household is poorer can be manifested in terms of i) attending formal school using conventional measures and working or ii) attending school in an alternative way that may or may not be called work. To add some support to this inference, we come back to look at the problem of missing values in terms of percentages. In the unrestricted sample, there are 99% missing values in 1997 and 98% missing values in 2000. Given the lower percentage of missing values ex-post compared to ex-ante and the larger sample size in 2000, it would be reasonable to say that if a missing value were imputed as a zero value for hours worked, then children worked more in 2000.

While the descriptive statistics provide us with a snapshot of behavior on average, we would like to better understand the changes in the shape of the distributions for children's number of hours worked. To do this we break down the distributions by school type. Figure 4 captures the distribution of the treatment and comparison groups of children working and attending formal school. In the treatment group more children are working up to 20 hours / week compared to the comparison group. However there is more variability in the distribution for the treatment group and there are extreme outliers which may be reporting errors.

As such we can now attempt to analyze time use patterns for these children in the formal schooling system. We are unable to analyze the time use patterns of children in the non-formal and informal schools because of data unavailability. From Table 2, we know that the formal curriculum takes up 37 hours / week on average for the primary school level and 42 hours / week for junior secondary school level. If a child is simultaneously attending school and working and is aged between 6 and 12, time used adds up to around 57 hours / week (a 7 day week). Or in other words, 7.75 hours per day are split between school and work. School takes up 68% of time and work takes up 32% of time. Likewise if the child is older, aged between 13 and 14 and is in junior secondary school, time used for school and work totals up to around 62 hours / week. Per day, this translates into 8.85 hours where the split is 67% of time for school and 33% of time for work. It appears that based on time use patterns alone, time for work in relative terms does not interfere with a child's schooling process. It appears then that a child can have an uninterrupted human capital accumulation process. Furthermore this child is attending a formal school where as described in empirical studies this type of school has higher quality inputs.

In Figure 5 we can see the distribution for hours children worked and attending a non-formal school primarily for a religious education. From Table 5 it can be seen that the number of treatment and comparison group children attending non-formal school is hardly different. However the distributions are noticeably different for the treatment and comparison groups in the range of 0 to 20 hours. There is less clustering and the peak from the comparison group almost disappears in the treatment group. More interestingly, the distribution of working time for children in non-formal school is in a smaller range compared to children in formal school. It appears that children receiving a religious education work fewer hours on average compared to children receiving a secular education.

For children working and attending informal school (education within the home), the distribution of hours worked are similar for the treatment and comparison groups. See Figure 6. An interesting difference is that the density for the comparison group in the range of 0 to 40 hours worked is higher than for the treatment group. But the treatment

group has a larger spread the right of the distribution. It is possible then fewer children worked a smaller number of hours but some children worked a disproportionately high number of hours within the home. This has negative implications for the children working a high number of hours and the quality of education received from the home. Granted learning skills from the family is important, it may be argued that this does not replace learning in the formal school system. Besides, we cannot observe the outcomes stemming from education within the home. Furthermore it is established based on empirical work (Newhouse and Beegle, 2005) that the formal school has a higher school quality than other types of schools in Indonesia.

4.2 Children Working More in an Intra-Household Allocation Behavioral Context

We have some preliminary evidence that Indonesia children work more hours when their families are poorer. These children help their parents to cope better when there is less to go around for the family. Children can help by either increasing supply in the labor market or by taking over activities in the home that are normally the responsibility of the parents. Older children may help look after their younger siblings. Children may cook and clean. If they live in rural areas in the Outer Islands, they may help to assume some farming / vegetable & fruit collecting and livestock responsibilities related to agricultural and subsistence economies. To study and try to understand the intra-household allocation behavior, we proceed to estimate a simple linear fit between children's working hours and household income as measured by consumption and savings.

In Figure 7, we find that there is a positive relationship between children working more hours and household income increasing when there is a shock. This may be because children are making a positive contribution to household income by working for wages or by making savings around the home, taking over household tasks. Since we do not have any information on children receiving wages for work, we have to settle for children substituting for parents managing tasks. This may then mean that there is deferred spending for certain goods and services and / or savings on household resources.

While children may make a positive contribution to household income, parents may not necessarily exploit them. Parents still set aside a share of household income for their children's education. In Figure 8, it can be seen that there is a negative, downward sloping relationship between children working less and annual education expenditures increasing when there is a shock. It appears that poor households in Indonesia do have value for education and parents do what they can to get their children to develop their human capital. This preference for education in society may be related to its level of economic development (Easterlin, 1987 & 1989) where the World Bank has given Indonesia the country classification of lower middle income country⁵. So in the best case scenario, children continue to go to formal school. In the worst case scenario they learn a skill from home.

4.3 Children Working More in a Modernized & Spatial Context

So far our analysis has been focus on comparing the child labor phenomenon occurring in families below and above the threshold or structural break of the AFC. This analysis has been done parameter free and distribution free. We now attempt to introduce some parameters concerning our variable of interest in the population.

We use a reduced form to represent the function of g in our empirical strategy.

$$y_{it} = \alpha_0 + \beta_1 M_{it} + \beta_2 E_{it} + \beta_3 SF_{it} + S + JB + \varepsilon_{it}$$

The dependent variable y_{it} is number of hours the child works in a 7 day week. The parameters of interest captured are income M_{it} expressed in household per capita log terms; education expenses E_{it} expressed in log terms; dummies for the three sources of skill formation SF_{it} ; the treatment variable S and a spatial variable JB to represent the split between the modernized and urbanized more densely populated Java and Bali versus the Outer Islands that are relatively less modernized and urbanized. We run these parameters on pooled cross sections.

⁵ More information on country group classification:
<http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20421402~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html>

See Table 5 specification (i) which consists of the restricted sample with children reporting between 1 – 105 hours worked per week. Household income per capita increases with the number of hours a child works. But increased household expenditure on education ameliorates this effect. Skill formation coming from informal schooling and non-formal schooling are also associated with a reduction in the number of hours a child in a poor household works. Religious schooling has an even stronger effect than informal schooling in reducing the number of hours a child engages in work. The relatively large magnitude of the religious schooling variable almost cancels out the magnitude of the household income variable. Unexpectedly, the AFC as a treatment or structural break in child labor behavior is associated with a slight reduction as opposed to an increase in the number of hours worked. Spatially, the Java and Bali variable shows that children residing in these islands where there is more economic development than in the other islands, they work more hours per week. This suggests that as per other empirical studies (Frankenberg & Thomas, 2000; Suryahadi, Sumarto & Pritchett, 2002), the AFC produces spatially heterogeneous effects in Indonesia. To investigate this further, we run an additional specification (ii) on our restricted sample where we include an interaction variable for the AFC with Java and Bali. The coefficient for the interaction is positive and the magnitude is noticeably high. This is as compared to the individual variables which have negative coefficients and with relatively smaller magnitudes. However the results are still not statistically significant. Nonetheless it seems that children in Java and Bali were badly hit by the AFC and had to work more to contribute to the household.

In Table 5 with specifications (iii) and (iv) where the measurement for hours worked now is 0 – 105 hours per week in the observed data, we see how the results change. We run the same specifications from (i) and (ii) on the unrestricted sample that includes all children in the income distribution and we get (iii) and (iv). In terms of household income and expenditure on education, there is a negative relationship with hours worked. This is seen in both (iii) and (iv). What is interesting is now that the estimates in terms of size and direction, (ii) and (iv) are similar specifically for the treatment, Java and Bali and the interaction of the treatment with these two islands. In (iv), the treatment effect has now

become statistically significant at the 1% level and the interaction term is statistically significant at 5%.

This infers that the effects of the aggregate shock were far stronger in Java and Bali compared to the underdeveloped Outer Islands. We would like to explore this spatial difference further to help us to reduce selection bias which affects our OLS estimates. We would also like to be able to think about how to better control for differences in local social and economic conditions across the archipelago and increase statistical precision⁶. A more important argument for further research is that the context of Indonesia makes us rethink what is defined as urban and what is rural. A developing country that has an urban modernized area with economic growth may not necessarily be synonymous with more resources available to the household.

An interesting and unexpected piece of finding from Table 5 concerns children working and attending religious school. From the observed data, religious school can refer to Islamic, Catholic, Christian and Buddhist schools. The majority of responses come from children going to Islamic school. There is a negative relationship between the work and religious school variables. This estimate is statistically insignificant in the restricted sample (see (i) and (ii)) but becomes statistically significant at the 1% in the unrestricted sample (see (iii) and (iv)).

It appears that children from poor households tend to work fewer hours when they attend religious school. We explore this phenomenon of religious school further by asking what value households gain from sending their children to religious school. Arguably the value is based on a social, non-economic return. But we do not have enough information in IFLS to define this value in explicit terms. Instead there is information about religious education using the EBANAS test scores to measure educational outcomes. We start out by estimating a fit between children's hours worked and the five different EBANAS subjects recorded in IFLS. The relationships with the Indonesian language, Math, Science

⁶ This is based on a very helpful discussion with Jeffrey Smith and with reference to Friedlander and Robins (1995)

and Social Studies are spurious. But there is a negative relationship between hours worked and the religious education test scores. See Figure 9. Perhaps it may be posited that parents have a high value for religious education and would like their children to be in school more and work less.

5. Preliminary Conclusions & Continuing Research

From empirical studies, there are many questions about the phenomenon known as child labor. This ambiguity is reflected by the ILO preamble on the types of labor not targeted for elimination by policymakers in developing countries. To shed light on this phenomenon, we started out by thinking about the behavior of children in terms of time use patterns. We find that there are Indonesian children from poor households who simultaneously work and go to school be it formal, non-formal and / or informal. But does this necessarily mean that they have become child laborers and does this have negative human capital consequences? We still don't know whether a child's work and schooling behavior can cross a line where the work becomes harmful and indeed a target for elimination.

Perhaps these children are crossing a dangerous line when they work too many hours in a week. We have seen extreme outliers working 105 hours / week in response to the Asian Financial Crisis. On the other hand we find that children in the 25th percentile of the household income distribution in Indonesia working in the average range of 22 - 26 hours / week while going to school and they make a positive contribution to income. This can be in terms of reduced or deferred spending on goods and services and an increase in savings. When their families become poorer, they increase the average number of hours worked / week to 26 hours which translates to 3.7 hours a day. Formal schooling which takes up to 37 hours / week for primary school (5.2 hours / day) and 42 hours / week for junior secondary school (6 hours / day) remain uninterrupted. However it is unknown whether the children worked even more hours during the period of extreme volatility of the Asian Financial Crisis from 1998 to 1999.

But so far, what we know is that there are enough hours in the day for going to school and working to improve family welfare in poor households. None of these Indonesian children have dropped out completely from school to focus exclusively on work. There is evidence that despite being poor these families have a preference for education. They keep their children in school and attempt to maintain a share of the household budget for education expenditures.

In spatial terms we find that it is children residing in the more urbanized and modernized Java and Bali Islands who are working more hours a week compared to children in the less developed Outer Islands which consist of subsistence economies and economies with low levels of growth.

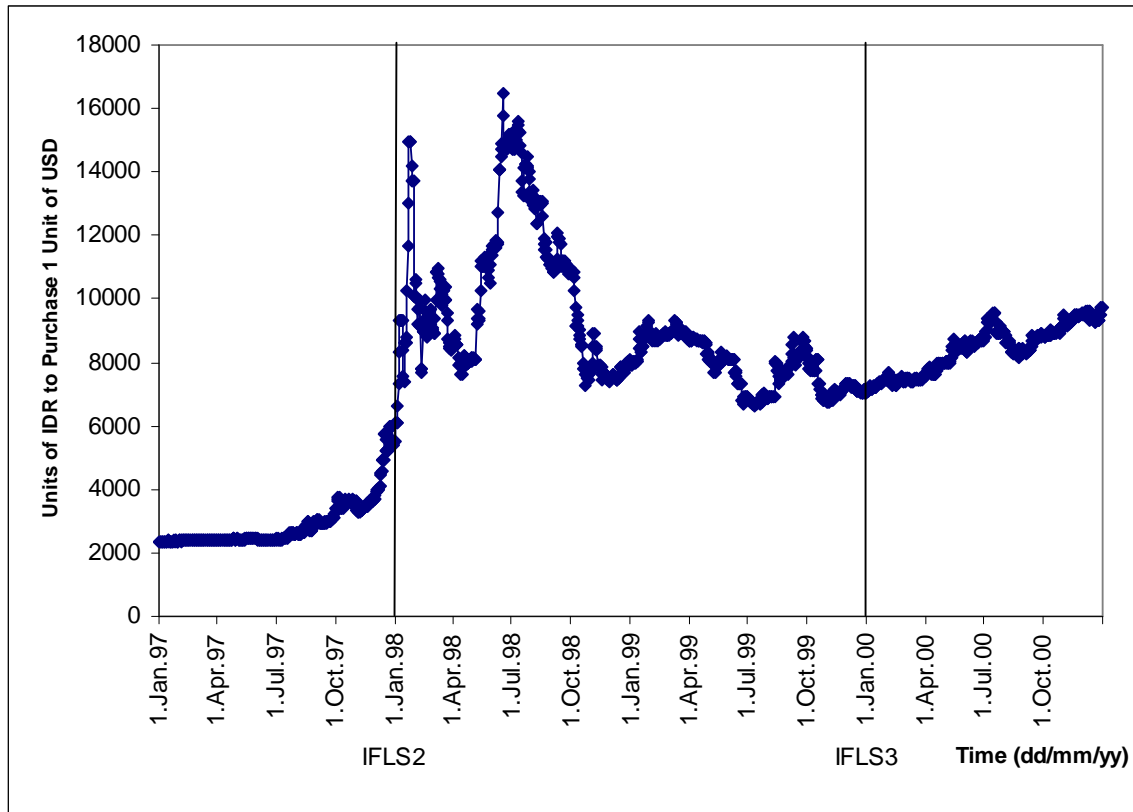
However human capital accumulation can be negatively affected in terms of schooling quality. Parents who can ill afford to send their children to the more expensive formal schools can resort to sending their children to two other school types found in Indonesia i) non-formal schools (religious schools) and ii) informal schools (education within the home). This is in addition to the children working some hours in the week. These two sources of skill formation make some contribution to a child's development but they may be of limited economic value in the formal labor market. But then again using the Becker view on human capital as being productive skills in broad terms, children may gain skills from these two sources that have returns in their local community. This is especially in the case of a middle income country like Indonesia which has a diverse culture. What children learn from religious school and the home may be social in nature such as the preservation of traditional values and heritage in their local community. This may especially the case for the indigenous communities in the Outer Islands who have yet to achieve greater levels of economic development.

There still remain a lot of unanswered questions about child labor and how it can affect human capital accumulation. For this paper we have only viewed human capital in terms of learning and building skills. This is insufficient because we need to better understand the health dimension of human capital. This is a priority to focus on in future research

and IFLS enables us to carry out this analysis. We can study child labor and the negative effects in terms of how often the child stays home ill, suffers fever because of malaria while working on a plantation and has asthma from pollution while working in an industrial factory. Then we can say something more about what the worst forms of child labor are and how to combat this.

Appendix

Figure 1 Us Dollar – Indonesian Rupiah Exchange Rate 1997 - 2000



Source: www.oanda.com online currency exchange website

Notes: Figure 1 represents the regression discontinuity design based on observational data from the RAND Corporation. IFLS2 is data for the comparison group where individual, household and community units of analysis were observed prior to the exogenous shock. IFLS3 is the treatment group of the units of analysis with the same characteristics. In the short-run during the period of maximum price volatility from January 1998 – December 1998, we could not observe adjustments to behavior. This is why we have chosen a fuzzy regression discontinuity design as opposed to a deterministic design.

Map 1 Coverage of IFLS in Indonesia



Notes: In studying how representative IFLS is of the Indonesia province, we assume that behavior observed in the provinces on islands surrounding Java and Bali represent underdeveloped, primitive societies. As such this behavior can be generalized to the provinces in Eastern Indonesia not covered by IFLS (islands near Papua New Guinea) and to the war torn province of Aceh. The islands that collectively surround Java and Bali and using Jakarta as the center are known as the Outer Islands. Or in spatial terms, this can be thought of as a radius where further out from the center, there is less modernization. Map 2 provides more detail concerning the different major islands that make up Indonesia.

Map 2 Islands in Indonesia



Table 1 Household Splitting for Schooling Reasons (“Did the individual move from the household for schooling reasons?”)

Comparison Group (Total Respondents for This Question = 681)

Age in 1997	Highest Grade Completed								Total
	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	≥ Grade 8	
< 6	1	0	0	0	0	0	0	0	1
6	4	1	0	0	0	0	0	0	5
7	1	4	0	0	0	0	0	0	5
8	0	1	1	2	1	0	0	0	5
9	0	1	4	6	2	0	0	0	13
10	0	2	1	2	8	4	0	0	17
11	1	1	0	0	6	3	1	0	12
12	5	5	0	0	4	5	2	1	22
13	4	6	3	0	2	1	0	1	17
14	7	10	12	4	0	2	0	5	40
> 14	124	102	110	44	12	7	1	281	544

Treatment Group (Total Respondents for This Question = 986)

Age in 2000	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	≥ Grade 8	Total
< 6	10	0	0	0	0	0	0	0	10
6	5	3	0	0	0	0	0	0	8
7	4	7	1	0	0	0	0	0	12
8	0	5	4	2	0	0	0	0	11
9	1	1	1	5	0	1	0	0	9
10	0	0	2	0	2	5	0	0	9
11	4	1	2	0	5	5	0	0	17
12	11	4	1	1	2	2	1	0	22
13	22	14	14	0	1	3	1	0	55
14	15	19	19	1	0	0	4	0	58
> 14	158	154	179	52	38	10	152	243	775

Notes: The ages reported by the treatment and comparison groups do not necessarily follow the school age e.g. when a child is 6 years old he or she enters grade 1. For more information on school age and birth age in the Indonesian education system, refer to Figure 2. The respondents for this question included illiterate adults (aged 15 – 50) in the IFLS who were receiving an education to complete grades 1 – 8. In practice, children normally start grade 1 at age 6 or 7. But there are also children who start later than age 6 or 7. As such school age and birth age may not be in sequence. Incidence of repeated grade is minimal in the observed data. For the RD, the treatment and comparison groups aged 6 – 14 make up the same unchanged 20% of total respondents moving.

Figure 2 Indonesian Education System

		Islamic S3 Program	S3 Program	Specialist Program 2				
		Islamic S2 Program	S2 Program	Specialist Program 1				
		Islamic S1 Program	S1 Program	D4 Program	D3 Program	D2 Program	D1 Program	
22	Higher Education							
21								
20								
19								
18	Middle Education	Islamic Sen. Sec. School	Senior General Sec. School				Senior Vocational Sec. School	
17								
16								
15	Basic Education	Islamic Jun. Sec. School	Junior Sec. School					
14								
13								
12								
11		Islamic Elementa School						
10								
9								
8								
7								
6	Preschool	Islamic Preschoo	Kindergarten					
5								

Source: Ministry of National Education (MoNE)

Notes: We study the Basic Education of children aged 6 – 14 (highlighted) which is defined as being their school age as opposed to birth age. We assume that children in this age group do not repeat grades. This is consistent with the information we have from MoNE concerning children in primary school and to a lesser extent lower secondary school who have a high probability of completing each school grade without repetition. This is partly associated with the family’s high value for education and the government’s efforts to keep children enrolled (Niehof and Lubis, 2003). However we do not have comprehensive information concerning religious schools. These schools are regulated by the Ministry of Religious Affairs where the student’s religious formation is a key objective.

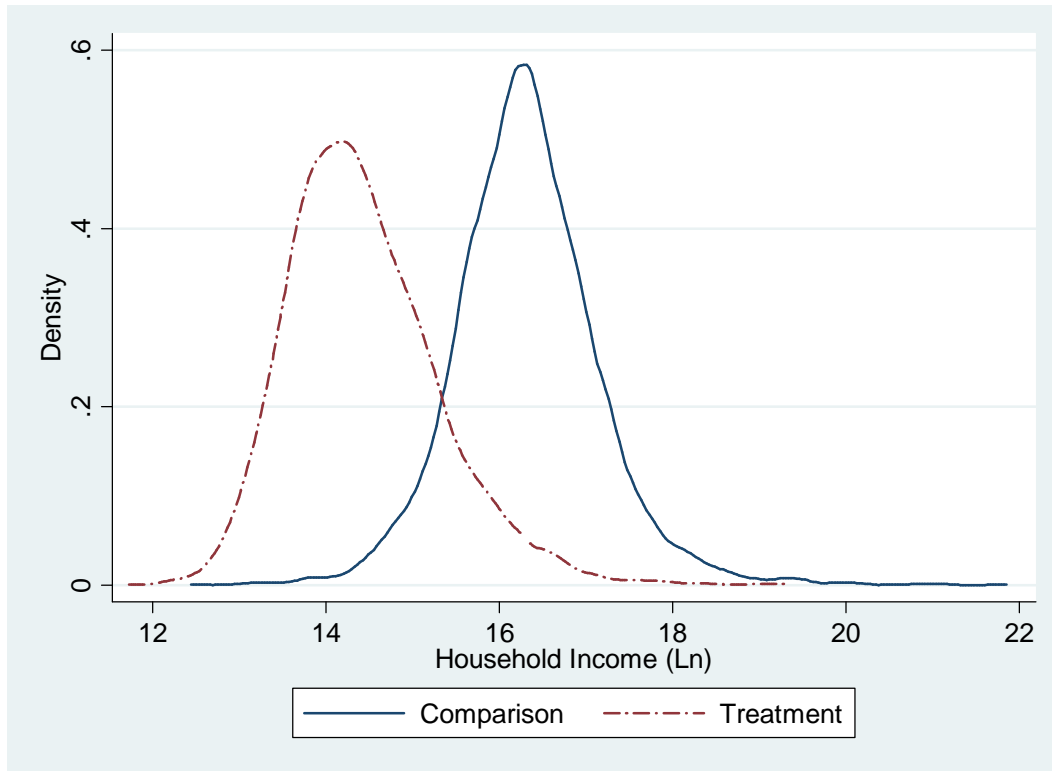
Table 2 Structure of Academic Hours for the National Curriculum by Primary School and Junior Secondary School

No	Subject Matter	Primary School						JS School		
		I	II	III	IV	V	VI	I	II	III
1	Pancasila Education	2	2	2	2	2	2	2	2	2
2	Religion	2	2	2	2	2	2	2	2	2
3	Indonesian Language	10	10	10	8	8	8	6	6	6
4	Mathematics	10	10	10	8	8	8	6	6	6
5	Sciences	-		3	6	6	6	6	6	6
6	Social Sciences	-		3	5	5	5	6	6	6
7	Handicraft and Arts	2	2	2	2	2	2	2	2	2
8	Health and Sport	2	2	2	2	2	2	2	2	2
9	English	-	-	-	-	-	-	4	4	4
10	Local Content	2	2	4	5	7	7	6	6	6
	Total	30	30	38	40	42	42	42	42	42

Source: Ministry of National Education

Notes: This is a full description of the national curriculum structure by academic hours. We are unable to use this whole structure for the analysis of time use patterns because IFLS does not cover outcomes related to *Pancasila* education (the Suharto regime propaganda promoting unification and nationalism); handicraft and arts; health and sport; English language education and local content. According to the IFLS User Guide notes, the household surveys could not be designed in a manner that would be able to cover all these subjects that represent the diverse interests of the polyglot nation. But nonetheless this structure provides us with useful information concerning the average number of hours per week used for teaching the formal curriculum.

Figure 3 Household Income Treatment Group and Comparison Group



Notes: The proxy used for household income is consumption and savings. Consumption is measured using the market valued prices of goods and services. This price data is tracked by BPS but has an urban bias because prices come from urban outlets spread across Indonesia. The value of in-kind transfers and own-production is not included. Savings is measured using cash on hand, bonds and stocks. It is assumed that this liquidity stems from the year observed and is not accumulated stock over time.

Table 3
Children Aged 6 – 14 Working > 0 Hours / Week & Household Income & Expenditures

Comparison Group

Variable	Observations	Mean	SD	Min	Max
Hours Worked / Week	92	22.09	17.44	1	72
Income (Ln)	92	11.03	0.66	9.23	12.99
Education Expenditures (Ln)	89	12.36	1.06	9.39	14.62

Treatment Group

Variable	Observations	Mean	SD	Min	Max
Hours Worked / Week	140	26.79	24.57	1	105
Income (Ln)	139	11.81	0.711	10.19	14.25
Education Expenditures (Ln)	114	13.11	1.13	9.21	17.47

Notes: The range of values for household income fall into the 25th percentile of the income distribution for the treatment and comparison groups. This can be seen by referring to Figure 3. The log of annual education expenditures are expressed in nominal Rupiah values, substantial increase in education expenditures ex-post is related to the Consumer Price Index doubling during the AFC.

Table 4
Children Aged 6 – 14 and Different Sources of Skill Formation

Number & Percentage of Children Attending Different Sources				
	Comparison Group	Percentage	Treatment Group	Percentage
Formal	4,343	87%	7,111	69%
Non-Formal	639	13%	2,474	24%
Informal	0		732	7%
Observations	4,982	100%	10,317	

Table 5
Children Aged 6 – 14 Working > 0 Hours / Week & Different Sources of Skill Formation

Number & Percentage of Children Attending Different Sources				
	Comparison Group	Percentage	Treatment Group	Percentage
Formal	34	37%	56	40%
Non-Formal	8	9%	9	6%
Informal	50	54%	75	54%
Observations	92	100%	140	100%

Notes: All children in this restricted sample come from families in the 25th percentile of the household income distribution. All children are reported as being registered in certain type school / source of skill formation. We do not have comprehensive information concerning children deriving skills from overlapping sources

Figure 4
Kernel Density for Working > 0 Hours / Week and Working and Attending Formal School

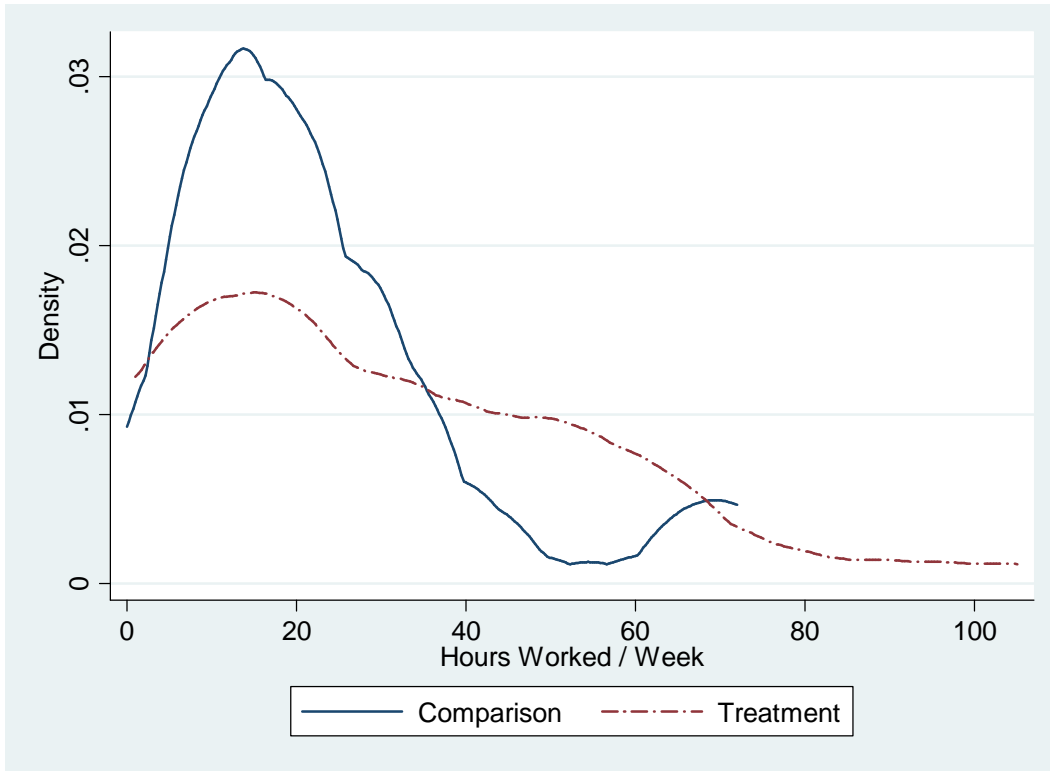


Figure 5
Kernel Density for Working > 0 Hours / Week and Attending Non-Formal School

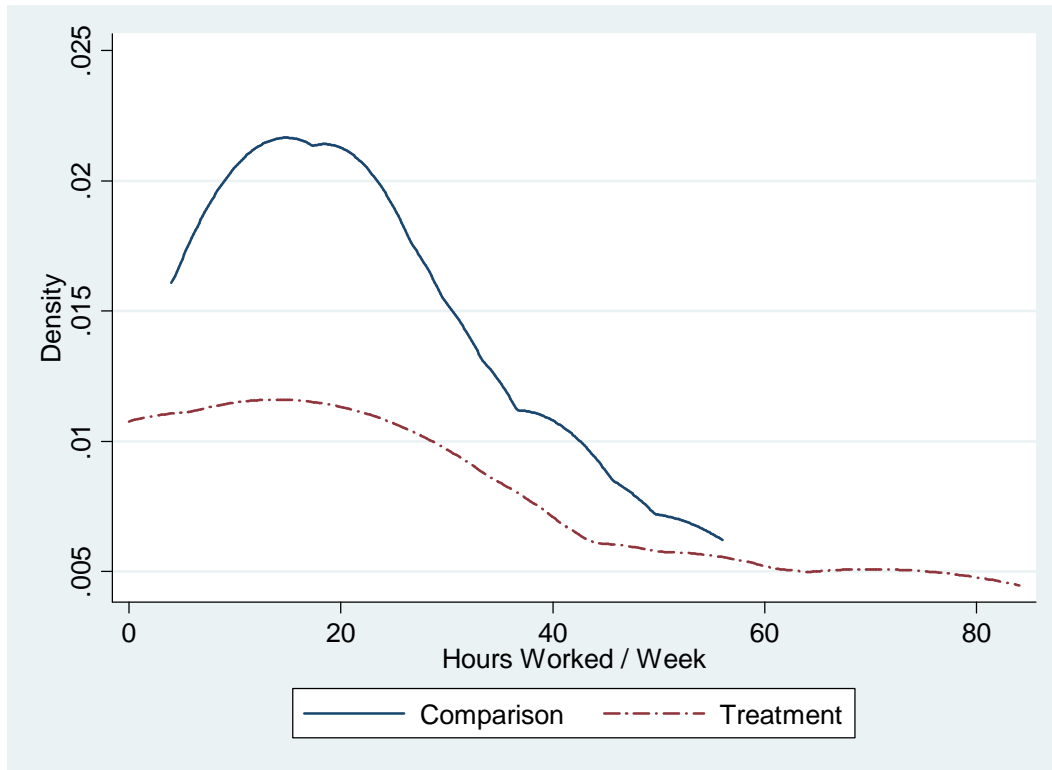


Figure 6
Kernel Density for Working > 0 Hours / Week and Attending Informal School

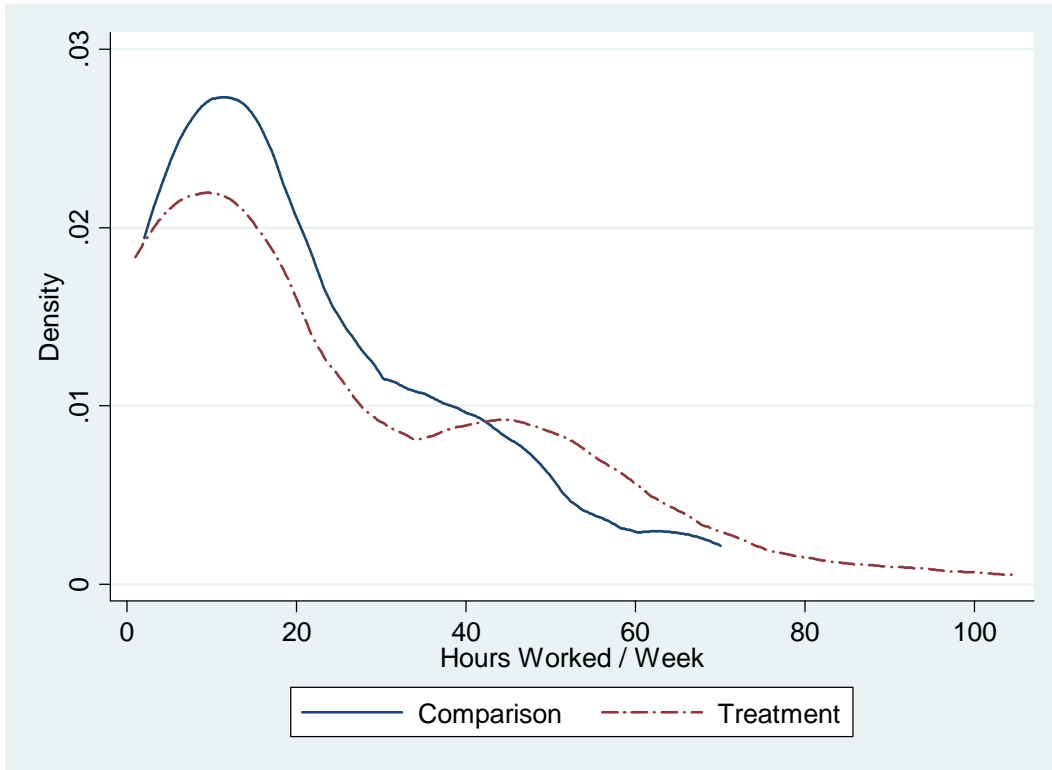


Figure 7
Relationship between Child Working & Household Income in Response to an Income Shock

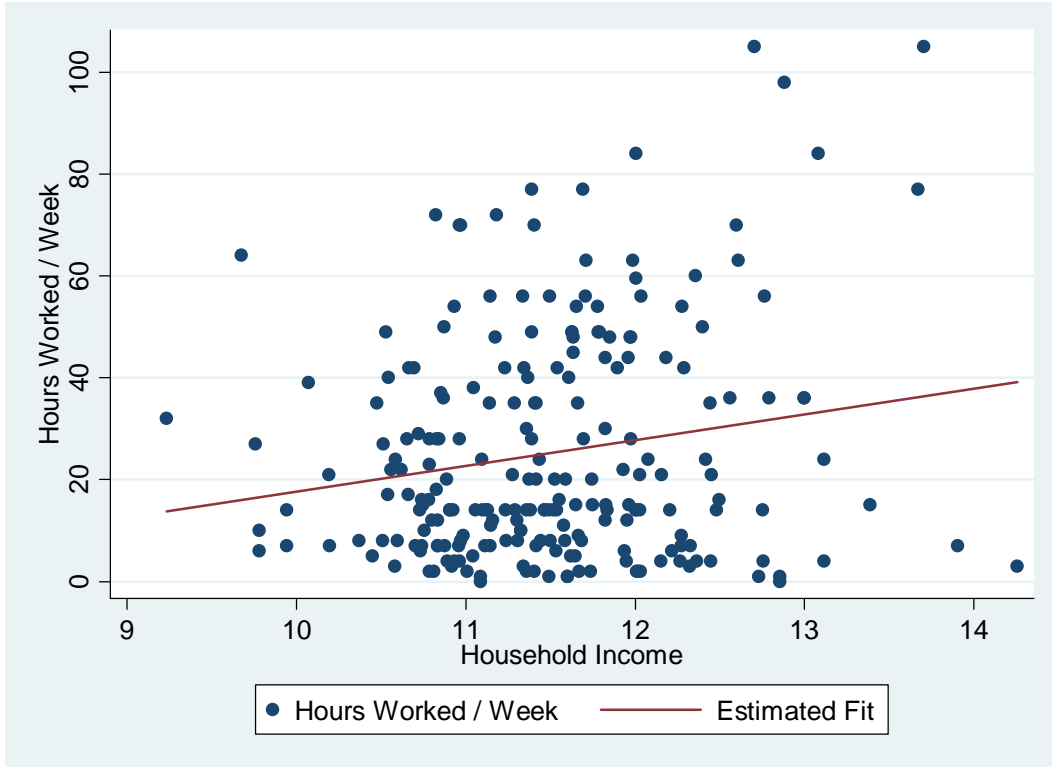


Figure 8
Relationship between Child Working and Share of Household Income Spent on Education in Response to an Income Shock

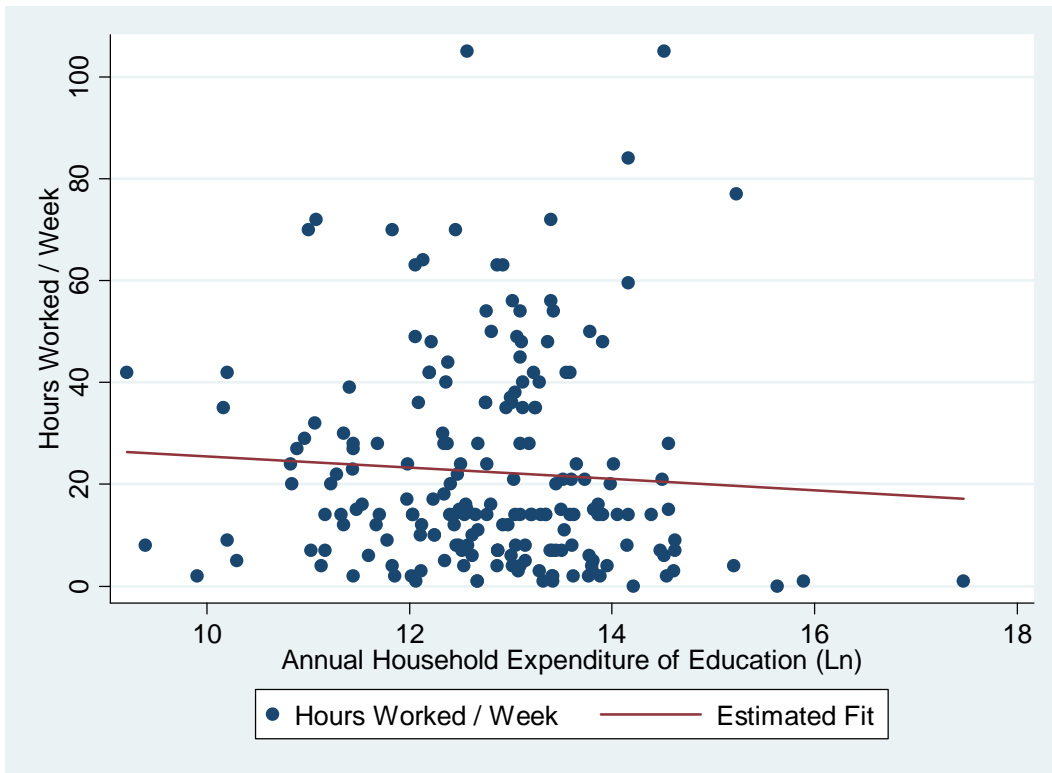
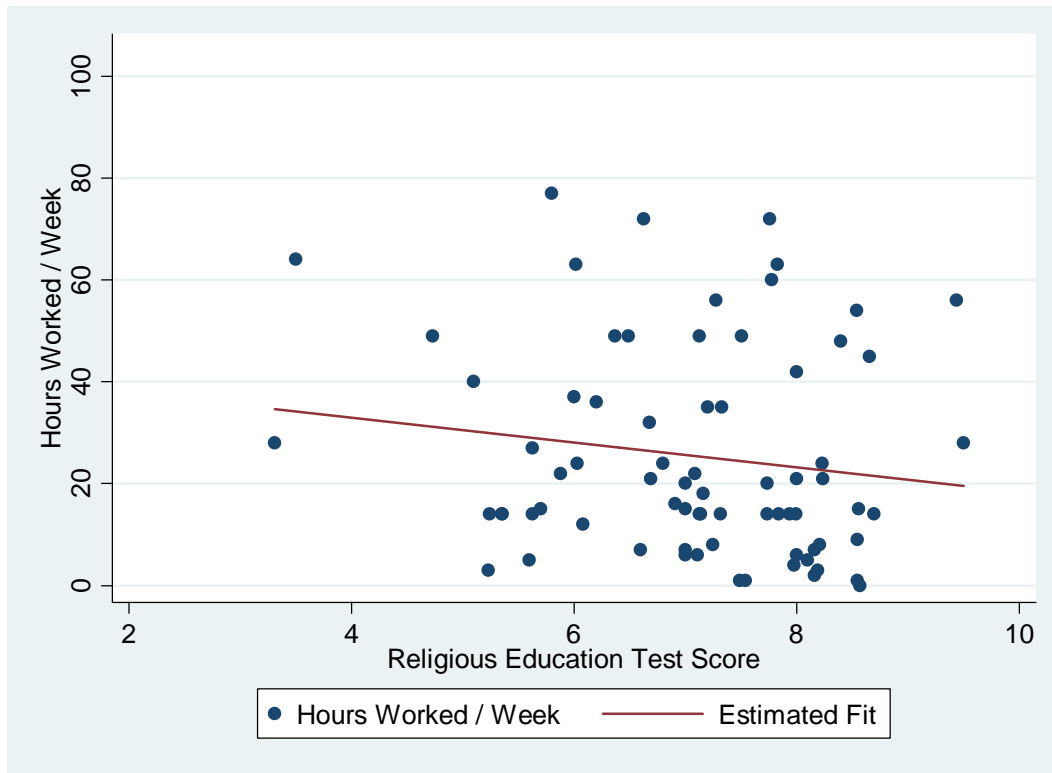


Figure 9
Relationship between Child in Informal School (Religious School) & Hours Worked in Response to an Income Shock



Notes: There is very little information available concerning the value of skills that a child gains from attending religious school. Using the EBTRANAS test score for religious education as a proxy, we take the position that a higher score is equivalent to a higher value gained from religious school. As such we interpret Figure 9 as a higher religious test score reduces hours worked by a child when there is an income shock. This may mean that parents have a high value for religious education and would like their children to be in school more and work less.

Table 5

Pooled OLS
 DV = Hours Child Aged 6 - 14 Worked in A 7 Day Week
 (Robust SE in Parentheses)

	Sample without Missing Values		Sample with Imputed Zeroes	
	(i)	(ii)	(iii)	(iv)
Independent Variables				
Household Income Per Capita (Ln)	3.414444 (2.972632)	3.495602 (2.921738)	-.0390176 (.0669608)	-.0372497 (.0662057)
Annual Household Expenditure on Education (Ln)	-2.324934 (1.634672)	-2.160042 (1.630203)	-.0349862 (.0331184)	-.028042 (.0324036)
Informal School (Education Within the Home) Dummy	-1.79327 (6.449352)	-1.322209 (6.524307)	.0701666 (.6057705)	.0311092 (.5970313)
Non-Formal School (Religious School) Dummy	-3.285865 (3.235164)	-2.625588 (3.242223)	-.5830697*** (.1559697)	-.5861818*** (.1549579)
Treatment Dummy	-.4378119 (3.031203)	-4.877755 (3.606128)	21.84586 (2.096831)	-.0522004 (2.492628)
Java and Bali Island Dummy	4.145122 (2.922297)	-.9451281 (3.839235)	.057736 (.0833147)	-.0522004 (.0616822)
Interaction of Treatment with Java and Bali		9.072438 (5.718462)		8.401765** (4.223592)
Constant	13.05115 (31.13243)	12.18694 (30.88955)	1.551162 (.7370569)	1.508264 (4.223592)
R ²	0.03	0.04	0.30	0.32
Observations	202	202	8,902	8,902

Statistically significant at the 1%***, 5%** and 10* levels

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